

HERNIA

Medical, Policy and Financial Considerations

by
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EXECUTIVE SUMMARY

1. The WCB of BC Rehabilitation Services and Claim Manual Policy item #'s 15.50 - 1.e and 2.e on hernia - post-operative wage loss, should be rewritten. The 42-day post-operative time loss component of the policy should be changed to reflect the current literature on this subject.
2. The 'work relatedness' of hernia(e) continues to be debated in the literature but, given various parameters, the present policy on 'acceptance' of hernia is appropriate.
3. Non-inguinal herniae should be adjudicated on the same basis as inguinal herniae.
4. Acceptance of any type of herniae should be on the basis of an 'aggravation' of a pre-existing condition.
5. There is no strong evidence found in the surgical and epidemiological literature to dispute the 18 months time frame in the Rehabilitation Services and Claims Manual Policy item # 15.51 for herniae reopenings and recurrences.
6. Any policy change should have an education program component directed towards the medical/surgical community as they play a pivotal role in how any change is effected.
7. Consideration of this change needs to incorporate the WCB's corporate view on whether policy is meant to 'cover' the average, most of, or the majority of individuals with this condition.

1.0 INTRODUCTION TO REHABILITATION SERVICES AND CLAIM MANUAL HERNIA POLICY

Since the mid 1980's the WCB of British Columbia has had in Rehabilitation Services and Claim Manual (RS & CM) Policy item #'s 15.50 and 15.51 on Herniae (see section 1.1). Over the years this policy has been put into practice and has given front line staff (adjudicators, entitlement officers, case managers, medical advisors and managers) direction on how to deal with claims involving (mainly) groin hernias. It should be noted that this policy was developed internally after consultation with the external community, including the general surgery section of the B.C. Medical Association. As a result of this inclusive development of policy both internal staff and external stakeholders (physicians, surgeons, worker and employer groups and advocates) had a 'baseline' or framework if you will, from which to work. From the medical standpoint, because of the BCMA involvement the external medical community was generally aware of the policy and understood the rationale and how such a policy worked within the 'system'.

1.1 The Need for a Review

More recently, perhaps over the last 5 years or so, there has been increasing criticism of this policy and many groups have suggested that RS & CM Policy item #'s 15.50 and 15.51 should be looked at once again from a policy, practice and medical perspective. Although there is no hard data to back it up, it is felt by many in the medical community that because of the aging of the physician/surgeon workforce and the introduction of hundreds, if not thousands of new physicians into the medical workforce of B.C. since the policy introduction in the 1980's, these 'new' physicians have not been involved or communicated with regarding the policy's basis and hence have little to no understanding of its foundation. This, in turn, has led to a change in expectations from the medical, worker and employer communities. For example, the initial policy development suggested (from a medical standpoint) that it was unusual for an individual with a work-related hernia to require pre-operative time off work. Similarly, it was felt that only in extraordinary circumstances would an individual require more than 42 days post-operative time loss. At present, we see on an almost daily basis that workers are being advised by their family physician and surgeons to remain off work until surgery has taken place and, not infrequently, to remain off work post operatively for greater than 42 days. Taking the advice of their physicians and surgeons in good faith, many workers do indeed then have time loss beyond what was initially seen as reasonable when the policy was developed in the 1980's.

Two other factors of note also give rise to the need for a critical appraisal of the WCB's present policy surrounding herniae. Perhaps the most important one is the technology surrounding surgical repair of hernia. The last decade has seen the emergence of sophisticated, 'minimally invasive' laparoscopic abdominal surgery. Every general surgery resident, in their 5-7 year post MD training program, is trained extensively in this highly technical mode of doing many types of abdominal (and other) surgery. Examples include gallbladder surgery (cholecystectomy), bowel surgery and, of course, inguinal

hernia repair. In many communities, the majority of inguinal hernia repairs would be done via this laparoscopic technique. The fact that such surgery is considered to be much less invasive than the more traditional 'open' repairs has led to what many surgeons believe to be a much reduced convalescence time period and a significantly quicker return to normal activities.

Perhaps the final factor suggesting the need for further review of RS & CM Policy item #'s 15.50 and 15.51 is the increasing body of knowledge seen in the surgical and epidemiological literature regarding many aspects of inguinal hernia – specifically, its pathophysiology, etiology or causation, its diagnosis and its treatment. Within that literature (which, because of its methodology is undoubtedly more valid than prior literature) is 'new' knowledge that invites critical review of the WCB's present policy on herniae.

To this end, the recently formed Evidence-based group has placed such a review on the priority list for many of the reasons mentioned earlier, in conjunction, with numerous internal and external requests for such a review.

1.2 Rehabilitation Services and Claims Manual, Policy item #15.50

On the basis of the Board's present understanding of the biologic characteristics of herniae, the following principles are followed to determine the acceptability of hernia claims. It is, of course, essential that the claimed work causation circumstances should be reported to the employer as soon as is practicable.

1. Direct Inguinal Herniae

- a. There must be increased intra-abdominal pressure or evidence of severe direct trauma resulting from the work or employment preceding the appearance of the hernia.
- b. There should be no prior hernia at the site.
- c. The age or general physical state of the claimant should be such as to predispose to the formation of a direct hernia.
- d. Pre-operative wage loss will not be allowed without adequate medical explanation of the reasons.
- e. Post-operative wage loss will be limited to 42 calendar days unless there are complications which justify an extension of the convalescent period and which are adequately described by the attending physician. The Board may require a further examination.
- f. The hernia will be considered to be an aggravation of a pre-existing condition and surgery will be recognized as an attempt to correct the aggravation.

2. Indirect Inguinal Herniae

- a. There must be increased intra-abdominal pressure resulting from the work or employment preceding the appearance of the hernia. The hernia should follow this event within a reasonable time period, normally no more than 72 hours.
- b. Where a claimant suffers bilateral herniae, it is extremely unlikely that both will have resulted from the same incident. However, where a claim for one of those herniae is acceptable in accordance with the principles set out above, the Board will accept responsibility for both herniae if the evidence is such that it is not possible to determine which of the two herniae did result from the employment.
- c. The hernia will be considered to be an aggravation of a pre-existing condition and surgery will be recognized as an attempt to correct the aggravation.
- d. Pre-operative wage loss will not be allowed except under unusual circumstances, which are fully detailed by the attending physician.
- e. Post-operative wage loss will be limited to 42 calendar days except where there are complications, which are fully explained by the attending physician. The Board may require a further examination.

In the case of inguinal herniae, sometimes the surgery must be done urgently because of certain threatening complications, such as bowel obstruction or inability to reduce the hernia. Most often there is no urgency about the operation and seldom is there need to stop work while awaiting surgery. There is no medical evidence to suggest that work generally aggravates a hernia, makes the surgery more difficult or less successful, or increases the complications following surgery. Where a treating physician's report certifies to the Board that the worker is disabled pre-operatively, other objective evidence regarding the worker's condition will be sought to either verify or dispute the treating physician's opinion. Usually this would consist of a medical examination at the Board.

When the first document is received on a hernia claim, a letter is immediately sent to the worker, which states in part:

"Please call (the Board) immediately if your doctor has told you to stay off work."

If the document indicates that the claimant is off work due to the hernia, the worker is also contacted by telephone by the Adjudicator to advise that the Board does not normally pay pre-operative wage loss on hernia claims. The adjudication of the claim is then accelerated. This could involve a telephone call to the employer to obtain the necessary information on which to base a decision.

Immediately following acceptance of the claim, if the claimant is still off work, the file will be discussed with a Board Medical Advisor, who should examine the claimant promptly if the question cannot be resolved by contacting the attending physician or surgical consultant. If the Board Medical Advisor confirms that the worker is not disabled, the worker is so advised at that time by the Adjudicator. This verbal decision is confirmed in writing. Wage-loss compensation will then only be paid up to the date of the examination, but will be reinstated as of the date of admission to hospital for surgery. The Board Medical Advisor may use discretion in such cases and decide to contact the treating physician to discuss the matter.

After surgery, the operative site usually heals without difficulty. Return to work in uncomplicated cases will be governed to some degree by the nature of the work to be done, but is usually possible in four weeks. Some complications may delay this return to work.

3. Femoral Herniae

These are unusual herniae and are generally not related to effort but may follow increased intra-abdominal pressure. Similar considerations will pertain as for inguinal herniae.

4. Epigastric Herniae

These are not generally secondary to trauma or strain.

5. Incisional Herniae

- a. If the primary incision is not the result of a compensable condition, the claim should be considered as a new claim and there should be:
 - i. an incident causing severe direct trauma to the site of the incision or marked increase in intra-abdominal pressure;
 - ii. the appearance of a hernia shortly after the occurrence of the trauma or incident;
 - iii. the incident or trauma should be reported to the employer as soon as is practicable.
- b. If the primary incision is the result of a compensable condition, the claim should be considered as part of the original claim unless there has been a significant new trauma. If there has been significant new trauma, a new claim should be established.

6. Diaphragmatic and Hiatus Herniae

These herniae should only be considered for compensation purposes if:

- a. There has been a severe crushing injury to chest or abdomen, or
- b. There has been direct trauma to the diaphragm (gunshot wound, stab wound, etc.) at the site of the hernia.

7. Internal Herniae

These are not considered to be related to effort, strain or work and are not compensable.

8. Umbilical Herniae

These are clearly congenital herniae and are not related to stress, strain, work effort or trauma, except in most unusual circumstances.

9. Incarceration of Herniae

Incarceration of hernial contents may occur during effort in a claimant with a prior hernia. The Board responsibility in this case is limited to relief of the incarceration, usually possible by manual manipulation. If manual manipulation is unsuccessful, however, surgery may be necessary. If surgery is necessary for relief of incarceration, it is a Board responsibility.

1.3 Rehabilitation Services and Claims Manual Policy item #15.51 Herniae Reopenings and Recurrences

1. Prior Compensable Herniae

a. Recurrence Under 18 Months

If no new incident is reported, such claims are usually reopened. If a significant new trauma is reported, it is usually adjudicated as a new claim.

b. Recurrence Over 18 Months

Such recurrences are generally adjudicated as a new claim and are decided on the merits of the case. This consideration, however, also includes evaluating the question of reopening the old claim.

2. Prior Non-Compensable Herniae

a. Recurrence Under 18 Months

These are adjudicated on the merits of the case. Because of the potential for recent hernia repairs to break down, it is expected that to be acceptable there must be clear evidence to establish a relationship of the breakdown to the worker's employment.

b. Recurrence Over 18 Months

These are adjudicated on the merits of the case.

2.0 WCB STATISTICS ON HERNIA

Policy item #'s 15.50 and 15.51 of the Rehabilitation Services and Claims Manual sets out the WCB of BC's policy on its handling of claims for herniae. To put this in perspective, the following are WCB generated statistics (data were downloaded from the WCB Enterprise Datawarehouse on August 28,2002. Additional data were provided by the Statistics Department).

5687 hernia claims were accepted in the 15 year period 1987 - 2001.

- 96.8% of the claimants were males and 3.2% were females.
- The average age of the claimants was 41.0 years old
- Males average 41.1 years old, older than females, averaging 40.4 years old.

According to its anatomical site, 5455 (95.9%) claims were accepted for inguinal hernia.

- 60 (1.1%) for femoral hernia
- 155 (2.7%) for umbilical hernia
- 17 (0.2%) for other sites.

The majority of the claims were granted for Short Term Disability (5648 claims, 99.3%).

- 17 (0.3%) claims were accepted for Health Care Only
- 20 (0.4%) claims were accepted for Long Term Disability.

During the 15 year period (1987 - 2001), the WCB of BC spent \$ 32,018,995.80 for all hernia-related claims.

- \$ 28,457,694.40 was spent on the 5648 STD claims, while \$ 3,554,229 was spent on the 20 LTD claims.
- On the average, \$ 5038 was paid for the STD granted claim.

Average number of hernia claims the WCB accepts per year	= <u>379</u>
Average number of calendar days wage loss paid	= <u>43 days</u>
Median number of calendar days wage loss paid	= <u>32 days</u>
Average weeks lost per hernia claim (estimated)	= <u>8.1 weeks</u>
Number of surgical procedures undertaken per year (1997-2001)	= <u>255</u>
Average surgical care cost per claim (surgeons fee only)	= <u>\$290.00</u>
Average total <u>HCO, STD and LTD</u> Claims costs for all claims per year	= <u>\$2,134,600</u>
Average total <u>health care costs</u> for all claims per year	= <u>\$142,000</u>
Average total rehabilitation costs for all claims per year	= <u>\$50,222</u>
From 1987-2001, 20 <u>LTD</u> awards for hernia claims, average <u>LTD cost</u> of	= <u>\$154,532</u>

The above statistics will be used further (section 9.0) in a cost / benefit analysis subsequent to the literature review.

Figure 2.1.1 and Figure 2.1.2, below, represent the number of hernia surgical invoices received for each of the many different 'types' of hernia surgical repair, for the years 1999 – 2001. The dollar amounts reflect only the surgical cost and do not include anesthesia, hospital or other rehabilitation costs.

During this 3 year period, there were 684 hernia repairs paid by the WCB. 84 (12.3%) were re-current cases. As you can see, it appears (unexpectedly) that the majority of repairs undertaken around the province are done via the open route (612 (89.5%) cases). While this may be influenced by the training of the surgeon and the facilities in which the procedure is undertaken, it is an important consideration as will be discussed under section 6.2 and 8.0.

It should, however, be noted that input from the B.C. Medical Association (Section of General Surgery) suggests the initial enthusiasm for laparoscopic hernia repair is now somewhat tempered and that our present data may well reflect how hernia surgery may continue to be undertaken in the province.

It is also worth commenting on the 'validity' of the data we have accessed. WCB's databases suggest we accept an average of 379 cases of 'herniae' per year. In the 3 years 1999 – 2001, 773 surgeries were paid for by the Board. Thus $773/1137 = 68\%$ of those individuals who had a claim coded as 'hernia', ultimately came to surgery. From a medical/surgical standpoint this would appear very low and makes the authors question the data's integrity. From a general standpoint, one would expect that the vast majority of individuals diagnosed with a hernia would ultimately come to surgical repair.

Initially, data gathered from WCB Enterprise Datawarehouse showed that in the 15 year period 1987 – 2001, there were 23 LTD hernia claims. Upon reviewing these individual claims, it was discovered that 3 (13%) out of these 23 hernia LTD claims were not accepted for hernia. Out of these 3, one was accepted for hand injury, one for low back injury and other for left groin strain and low back injury. Of the 20 hernia LTD claims, 14 (70%) were awarded LTD due to recurrent hernias (up to 4 times re-operation), 3 (15%) due to accompanying low back injury and 3 (15%) due to post-operative ilio-inguinal nerve entrapment. Overall, there were 6 (30%) LTD cases who had post-operative ilio-inguinal nerve entrapment.

Figure 2.1.1 No. of herniorrhaphy cases paid by the WCB of BC in the year 1999 – 2001.

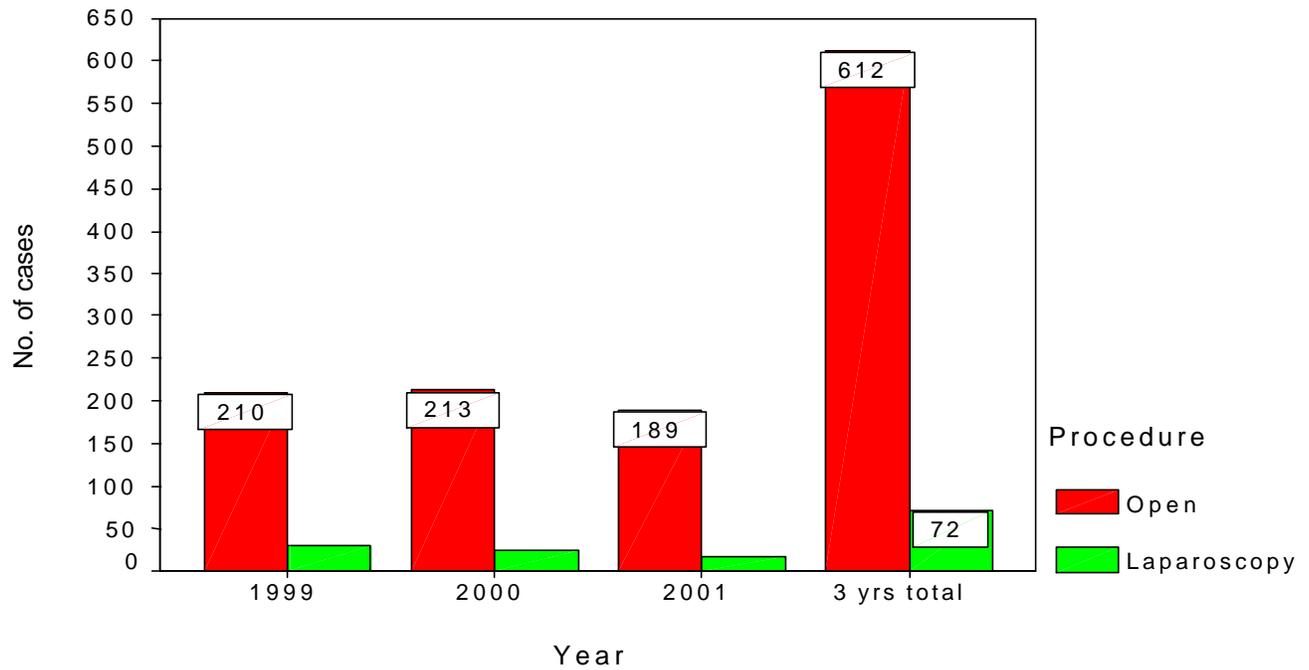
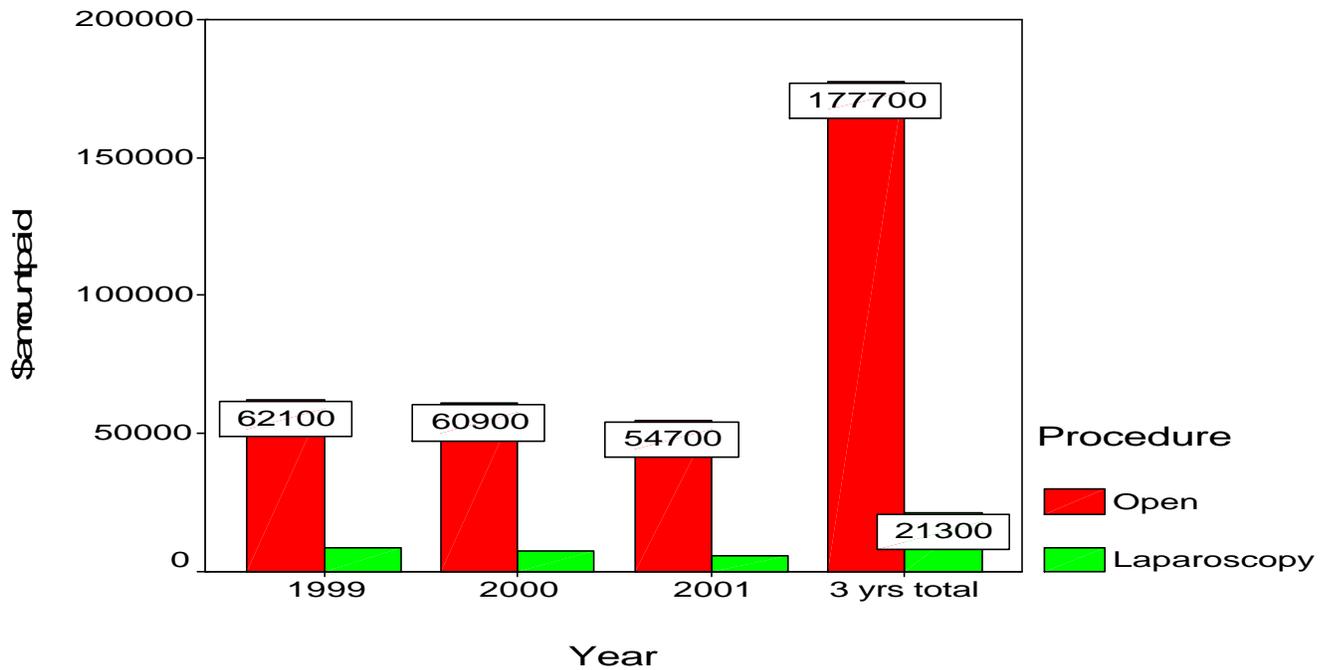


Figure 2.1.2 Number of dollars spent by the WCB of BC for herniorrhaphy in the year 1999-2001 (surgeon's fee only)



3.0 LITERATURE SEARCH STRATEGY

An overwhelming amount of literature has been published concerning groin or inguinal hernias. For this reason, search results were limited by year (1990 to the present) and by language (English). In addition, major databases were searched for the three aspects of hernias:

1. etiology or risk factors (for primary and recurrent hernia)
2. surgical treatment
3. disability

The strengths of each database were matched to the focus of the search in an effort to reduce duplication and keep the search results to a manageable number.

THE FIRST SEARCH focused on the causes of hernias, both generally and in an occupational context. PubMed and OSH-ROM were chosen for this reason and searched separately. The major subject *hernia, inguinal* was used in conjunction with such PubMed subheadings as *etiology, epidemiology, and pathophysiology*, as well as publication types of *review* and *meta-analysis*. Further keywords such as *risk factors* (also used as a subject) and *lifting* were searched to ensure that key concepts were included. Because OSH-ROM has a strong emphasis on occupational medicine, more so than PubMed, it was also searched using similar keywords.

THE SECOND SEARCH focused on surgical treatment and outcomes. Since PubMed provided sufficient coverage, it was the only database searched. In PubMed, the major subject *hernia, inguinal* was combined with the subheading *surgery*, and the results were narrowed by using the subject heading *treatment outcome, return to work or return to daily activity* and publication types: *review, meta-analysis, practice guideline, clinical trial, and randomized clinical trial* with limitation toward human subject.

THE THIRD SEARCH focused on disability from hernias. PubMed was searched by combining subject headings of *hernia, inguinal* with *disability evaluation, work capacity evaluation* and *workers' compensation*. The resulting number of hits was much smaller, and a further search of the DIALOG databases, Embase, Biosis, Scisearch, and Insurance Periodical Index, supplemented the PubMed results. The DIALOG search used relevant keywords in the title and descriptors.

After the articles were obtained, further articles were selected from the references. Appropriate non-English papers were retrieved and translated. Overall, there were 233 manuscripts retrieved and 214 of these articles were cited in this study.

4.0 REVIEW REFERENCES / BACKGROUND MATERIALS

As previously noted – there is a vast literature on many different aspects of hernia. While the initial intent of this review was to examine the issue of ‘etiology’, it became very evident from the background reading that this issue was of lesser importance than that of postoperative ‘disability’. To this end, the authors have separated the background review materials into two (2) sections, namely:

- i) ETIOLOGY / PATHOPHYSIOLOGY / EPIDEMIOLOGY OF HERNIA
(Appendix A) and
- ii) RETURN TO ACTIVITY / POST OPERATIVE CONVALESCENCE
(Appendix B).

All references within the body of the text will be cited as per convention in the reference section at the end of this paper.

5.0 HERNIA – MEDICAL / SURGICAL ASPECTS

The following portion of this document describes many of the medical and surgical aspects of hernia, including its epidemiology, pathophysiology and etiology. All references are cited and are included in the reference list at the end of the document. The reader should be aware, however, that numerous papers and texts that were necessary 'background' reading are not always cited. Specifically, because of the nature of the review, it was not amenable to a 'high level' systematic review as has been undertaken with other evidence based projects. Specifically, the issue of etiology of hernia did not allow for 'only' randomized control trial or other 'gold standard' analysis. Case report and case series type of studies were also included. To this end, and recognizing the potential policy considerations of this review, the author describes only some of the more often cited and quoted views on this subject. However, other, non-referenced literature is attached in appendices A and B. Any reader wishing to review that wider body of information can then do so.

Similarly, the section on return to activity issues (Section 6.0) describes many papers and other documents reviewed. It is not inclusive of all the materials assessed – these are all outlined in Appendices C-G. As noted earlier in this paper, it became clear during the early phases of this project that perhaps the most important portion of RS & CM policy item #15.50 that was not 'in line' with much of the literature was that of post operative convalescence. To this end, that portion of the surgical literature was extensively reviewed with its goal being to retrieve as much numerical data as possible on the subject. That is the subject of Section 6.2.

5.1 Definition

Schwartz *et al*⁵ defines hernia as a protrusion of a viscus through an opening in the wall of the cavity in which it is contained. For the purposes of this paper we will be discussing abdominal wall hernia and its implications to WCB in terms of its financial, medical and policy considerations.

5.2 Abdominal wall herniae

The hernial orifice is the defect in the innermost layer of the abdomen, and the hernial sac is an outpouch of the peritoneum. Abdominal wall hernias only occur in certain areas – namely, where aponeurosis and fascia are devoid of the protecting support of striated muscle. Many such areas are present in the 'normal' individual but others may be acquired through muscular atrophy, surgery or trauma. Because of these anatomical relationships, common sites of hernia include the groin, umbilicus and the linea alba. Other hernia sites are less common and will not be the subject of this paper. Figures 5.1.1 and 5.1.2 illustrate this definition.

5.3 Groin Herniae

Groin herniae are generally divided into two types. Those that occur above the abdominocrural crease are described as inguinal and those that occur below this anatomical landmark are defined as femoral hernia. Inguinal hernia are further divided into direct type (where the sac protrudes outward and forward) or indirect where the sac protrudes obliquely or tangentially toward and occasionally into the scrotum.

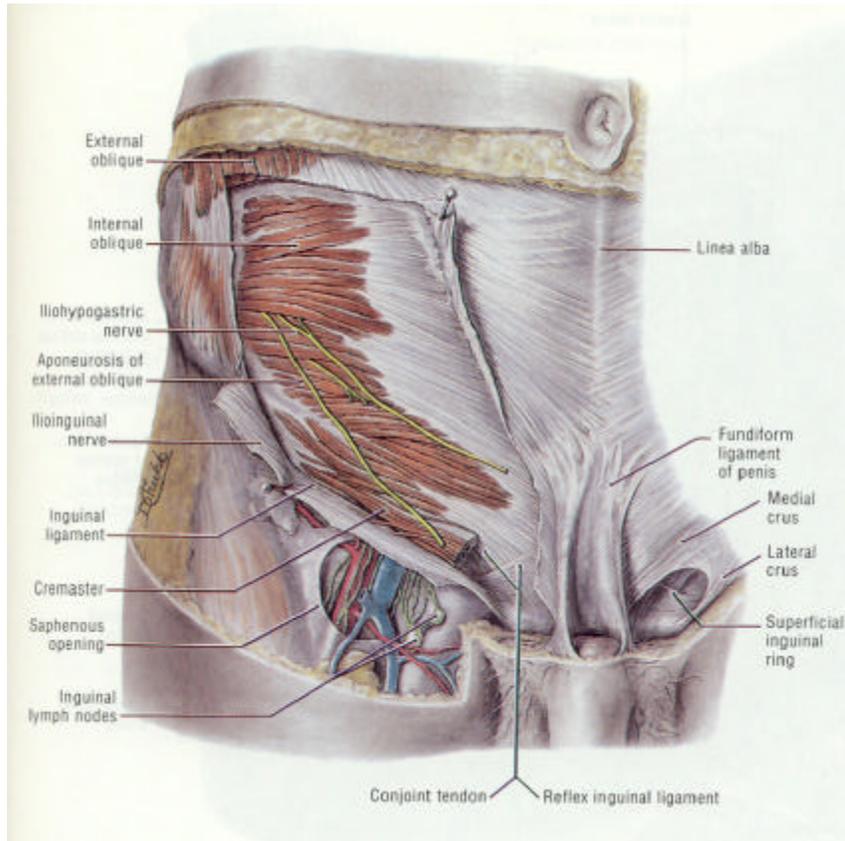


Figure 5.1.1 Anatomy of the groin²¹⁶

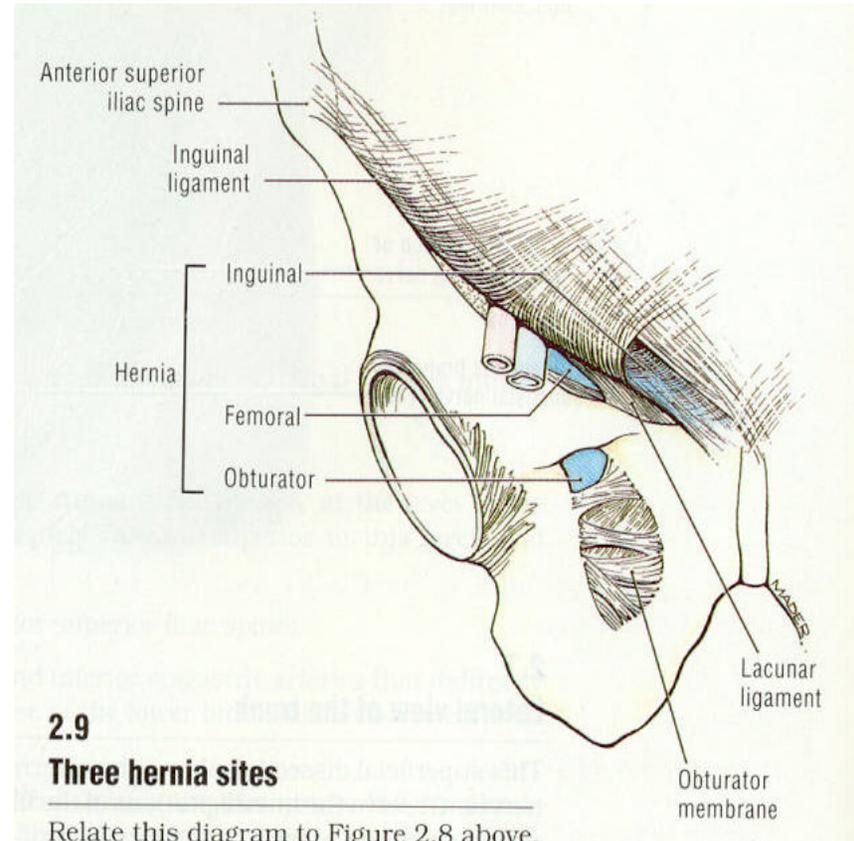


Figure 5.1.2 Possible location of hernia in the groin region²¹⁶

5.4 Epidemiology

It is estimated that in the United States 700,000⁵⁹ herniae are repaired yearly. As far back as the mid 1800's there is evidence that suggests that the prevalence of hernia was approximately 3.2% (1,152,000 in a population of 36 million). Rutkow¹⁰¹ describes much of this early epidemiological work including its prevalence, incidence and demographic features. A 1978 study by Abramson *et al*⁹⁷ contrasts somewhat with a RAND study⁵ done in 1983 in terms of its burden to society. Despite this it appears that the prevalence in North American society is 2.5 – 4%. Well entrenched in this literature is the knowledge that abdominal wall herniae are much more common in males than females. The Shouldice Hospital in Toronto has the largest service and experience in hernia repair. Figures from a 1993 paper¹⁶⁸ suggest that women account for only 2.5% of the 250,000 cases treated at the hospital over a 50 year period. Tables I and II¹⁰¹ describe some further descriptive statistics that were produced after combining a US National Hospital Discharge Survey and a more recent US National survey of Ambulatory surgery.

Table 5.2.1¹⁰¹

ABDOMINAL WALL HERNIA OPERATIONS IN THE UNITED STATES, 1996

Procedure*	Outpatient	Inpatient	Total
Inguinal hernia			
Unilateral repair (53.0)	458,000	62,000	520,000
Bilateral repair (53.1)	<u>73,000(x 2)</u>	<u>15,000(x 2)</u>	<u>176,000</u>
	604,000	92,000	696,000
Femoral hernia (53.2)	19,000	6,000	25,000
Umbilical hernia (53.4)	120,000	46,000	166,000
Incisional hernia (53.51 and 53.61)	40,000	57,000	97,000
Other abdominal wall hernia (epigastric, spigelian) (53.59 and 53.69)			

*Figures in parentheses represent ICD-9-CM codes.

† These figures do not include Veterans' Administration and other federal government-type facilities.

Accordingly, for groin hernia repairs with their overwhelming male distribution, the numbers should be increased an additional 5%.

‡ Bilateral inguinal hernia repairs were multiplied times two to account for the total number of individual inguinal herniorrhaphies.

Table 5.2.2¹⁰¹

AGE AND SEX CHARACTERISTICS OF HERNIORRHAPHY PATIENTS IN THE UNITED STATES, 1996

Procedure*	Male	Sex (%)		Age (%)		
		Female	<15	15- 44	45-64	>65
Inguinal hernia (53.0 and 53.1)	90	10	18	29	23	30
Femoral hernia (53.2)	30	70	<1	19	29	48
Umbilical hernia (53.4)	57	33	13	33	36	17
Incisional hernia (53.51 and 53.61)	35	65	<1	25	35	39
Other abdominal wall hernia [epigastric, spigelian, etc.] (53.59 and 53.69)	43	57	1	32	40	26

*Figures in parentheses represent ICD-9-CM codes.

T These figures do not include Veterans Administration and other federal government-type facilities. Accordingly, especially for groin hernia repairs with their overwhelming male distribution, the "true" percentage for males will be slightly higher.

From a societal standpoint (including WCB's) it is of significance what an individual's 'causal perceptions' are regarding hernia. Rutkow¹⁰¹ describes many of these from a recent (1997) random survey of 1000 Americans. He notes the following:

- “98% of respondents believed hoisting a heavy object could cause hernia
- 54% felt that coughing could produce a hernia
- 60% felt that injury could be causative
- 54% thought obesity could contribute to hernia formation
- 40% suggested lack of experience was important in its formation
- 2% felt smoking had an impact on its development

Of interest, 62% understood that individuals could be born with a hernia

Regarding surgical treatment, of those interviewed:

- 42% felt a hospital stay of at least three days was required.
- 9% were aware of it being a day care procedure.

When asked about return to normal activities post operatively:

- 66% felt it took a month or more”

An earlier study⁵ suggested:

- 91% of individuals interviewed felt there was no need for activity restriction prior to repair.
- 4% felt the presence of a hernia impacted on the majority of activities of daily living.

5.5 Pathophysiology / Etiology

Donahue³⁴, in a chapter in the recent textbook HERNIA – 4th Edition (1995), describes many theoretical aspects of hernia including its anatomy, its pathophysiology, its diagnosis, its treatment and, of course, its etiology. In each of his reviews he notes that congenital factors are undoubtedly important in its genesis (especially in indirect inguinal hernia development) but that *“Equally important causes that cannot be easily described are related to the wear and tear of living, such as repetitive local trauma, degenerative changes associated with increased abdominal pressure and altered collagen synthesis in middle age”*.

In his discussion of the less common umbilical hernia Donahue³⁴ concludes *“The emphasis on congenital factors is not meant to imply that sudden stresses such as abdominal trauma or industrial accidents, or chronic processes, such as multiparity, may not play a role in the sudden appearance of hernia in a patient previously without symptoms. The latter factors are thought to be provocateurs only in the presence of ‘fertile ground’ – the weak or attenuated transversus-transversalis layer”*. A more in depth discussion of altered collagen metabolism, malnutrition, smoking, repeated strenuous activity, and iatrogenic factors are available in Reference³⁴.

In 1959, Davis¹⁰⁵ produced a case series report on five healthy adult males. His study looked at intracavity pressures (esophagus, stomach, rectum) in those individuals while lifting a series of weights in a number of different positions. His data showed that *“there is but little pressure change within either trunk cavity when weights are lifted in the erect posture. They show that there is a considerable increase in pressure when stooping, and that there is a direct relationship between the magnitude of the weight and the height of the pressure induced”*. He further concluded that *“the intraabdominal pressures are largest in the stooping and prone positions, so that hernia and prolapses seem less likely to occur if the positions are avoided when lifting: additionally, of course, bending down to lift a weight is clearly contraindicated in the postoperative management of reparative procedures”*. Present physiological and surgical thinking may dispute his conclusions^{34,60,61,85}.

In 1976 Abramson *et al*⁹⁷ undertook a community health survey in a neighborhood of western Jerusalem. As part of this cross sectional survey they examined the ‘epidemiology’ of hernia in that population. Among 1883 men examined, Abramson found 459 men with inguinal herniae. Recognizing the limitations of their investigation they found the following:

The prevalence rate for those aged 25 and over was 18 occurrences /100 men

- the lifetime prevalence was 24 occurrences /100 men
- the prevalence of hernia rose with age
- the prevalence of hernia was significantly higher in those men reporting the presence of varicose veins, symptoms suggestive of prostatism and evidence of hemorrhoids.
- the presence of hernia was low in men in the presence of obesity

- there was no significant increase in those that reported chronic cough, constipation or physical activity at work

Others have looked specifically at 'new' factors thought to possibly relate to hernia development. Liem et al⁵² looked at potential risk factors in women in a small study involving six hospitals in the Netherlands. The researchers concluded that total physical activity was not associated with hernia and more notably that a high level of sports activities was associated with less inguinal hernia. Liem et al also found that obesity was protective for hernia development. Other findings that contrast to earlier reports suggested smoking, appendectomy, other abdominal operations and multiple deliveries were not associated with increased risk of hernia development. They did identify two positive risk factors, namely positive family history and constipation.

In a retrospective case control interview study out of Spain⁵⁵ looking at risk factors associated with inguinal herniae the authors suggested that the only positive risk factor was level of physical effort.

A more recent cross sectional study performed by Kang *et al*⁶⁵ noted that in 1994 there were an estimated 30,791 work related hernias in males reported by US private health care establishments. After their analysis they concluded that although the rate ratios for hernias varied significantly within occupations and industries, the highest rate ratios found were in those industries and occupations involving manual labor. They suggested this lent support for the 'hypothesis' that hernias can be work related.

In a more biomechanical, physiologically oriented study on groin connective tissue characteristics, Pans *et al*⁷⁶ used fresh samples of groin tissue harvested from individuals undergoing hernia repair and subjected them to various biomechanical stresses. The authors suggest their findings allow the conclusion that 'presently reported biomechanical alterations seem to be the cause and not the consequence of hernias'. This is therefore in keeping with other authors' thoughts that inherent connective tissue pathology 'probably plays a role in the genesis of groin hernia'.

A paper by Flich *et al*⁷⁹, out of Spain, assessed various suspected 'risk factors' in the development of hernia. They attempted to look at the 'origin' of inguinal hernia in relation to level of physical work activity. They concluded that there was indeed, a positive relationship. They stated in their conclusions that "the results of this study show that physical effort, as a risk factor, is closely related to the appearance of inguinal hernias. A person whose work involves lifting or other strenuous exertion has a higher risk than those whose jobs are less strenuous. This conclusion was reached after taking into account not only the weight lifted, but also the number of years in this activity."

In 1997, Akin *et al*⁸⁰ examined 27,408 army service men aged 20 to 22 years old. 3.2% of those examined showed physical evidence of an inguinal hernia. These figures are certainly in keeping with the previous studies that have been mentioned.

Abrahamson¹⁰⁷ has produced a relatively in-depth article on the etiology of both primary and recurrent groin hernias. He makes a number of points which are summarized below:

“The factors that bring about the failure of the fascia transversalis in less than 5% of humans and those that ensure its permanent integrity in the others are the issues that must be addressed when considering the etiology and pathophysiology of groin hernias...the cause of groin hernia is probably multifactorial with one or more factors applying in any particular case.”

He then discusses, in detail, many potential elements that enter into multifactorial etiology including:

- the patent processus vaginalis
- defect in the physiologic shutter mechanism. The shutter mechanism protects areas in the groin which are weak in nature. This mechanism is activated when the abdominal muscles contract and can increase in intra abdominal pressure
- passive raise of intra-abdominal pressure with relax abdominal muscle such as in pregnancy. Passive raise of intra-abdominal muscle will not activate the shutter mechanism to protect the weak area in the abdomen
- the integrity of fascia transversalis - collagen pathophysiology. Collagen fibers make up the tissue of fascia transversalis and give it its strength. Disturbance in the normal production of collagen, such as among those who have Marfan's syndrome, will create a weaker area in the fascia transversalis
- heredity ... *“Heredity also plays a part in development of groin hernias, as evidenced by the high incidence of hernias in several generations of a family above that of the general population. It is not clear whether in these families there is a higher incidence of patent processus vaginalis or a defect in the structure of the fascia transversalis, or both”.*
- cigarette smoking. It's been shown that smokers have a systemic protease-anti protease imbalance. It is hypothesized that this condition is causing damages to collagen and connective tissue
- general factors. Under this section, Abrahamson notes *“The incidence of groin hernia is the same in sedentary workers as in heavy manual laborers, indicating that strenuous physical activity alone does not cause hernias; however it does bring about a rise in the intra-abdominal pressure and so may cause an existing small and unnoticed groin hernia to expand and become more obvious. It may also be the final factor bringing on a hernia in those predisposed to herniation by other, more basic causes”.*

In 1996, another United Kingdom study by Smith *et al*⁴⁹ looked at 129 patients with inguinal hernia. They reviewed the 'issue' of whether hernia could be said to be due to a single muscular strain. They concluded, *“This study confirms that there is seldom any subjective association between a muscle strain and the onset of a*

groin hernia.” They also commented that given the prevalence of herniation in the general population at 4% the ‘high incidence of contralateral hernias in our series as a whole (38%) also suggests that constitutional factors are of considerable importance.’ They suggest some guidelines in assessing whether an ‘event’ may have ‘caused such hernia’.

In an article entitled *“Inguinal Hernia: Medicolegal Implications”*⁴⁸ from the United Kingdom, Schofield, a professor of surgery at the University of Manchester undertook a retrospective review of 108 patients who had been referred to him by solicitors for *“examination alleging groin injury at work”*. While there are obvious inadequacies and deficiencies in this review, the author concludes *“It should remain established that, before a case is accepted as traumatic in origin, there is a demonstrated close relationship between a causative event and the development of the hernia”*.

5.6 Non-Inguinal Herniae

It is recognized that this nonsystematic review of the etiology and pathophysiology of herniae formation will have its critics. However, the literature on this does not readily lend itself to such an academic review. The Evidence-based group does, however, feel strongly that reasonable conclusions can still be drawn from the information at hand.

It does appear evident that rarely, if ever, can one single entity be said to be causative of inguinal herniae formation. As discussed, many factors have a role to play. The literature around non-inguinal herniae is even less voluminous when it comes to etiology. Umbilical, ventral, incisional, epigastric, femoral and other less common herniae certainly have their similarities and specific differences when compared to inguinal herniae. Hernia, such as umbilical hernia, may have more of a congenital contribution but in the adult patient it would appear that once again, many factors are necessary for the appearance of the condition.

If one accepts, from a ‘compensation’ standpoint that inguinal herniae are never solely due to work effort or trauma, then the Evidence-based group feels that the WCB should accept such herniae on an ‘aggravation’ of a pre-existing condition basis only.

Similarly, the Evidence-based group feels that non-inguinal herniae should be treated by the WCB on the same basis.

6.0 RETURN TO ACTIVITY ISSUES

6.1 General Issues

As one can see, since Bassini's historical paper written in 1897¹¹⁹ on hernia and its repair, there has been much thought and in-depth discussion on the actual etiology of hernia development. Perhaps over the last 20 years or so, these 'thoughts' have been held to higher standards and a more rigorous level of science, as some of the studies quoted above demonstrate.

Many 'older' notions have not withstood scientific scrutiny. For instance, the 1959 article by Davis¹⁰⁵ and his notion that postoperative lifting of weights should be avoided is in direct contrast to the now more prevalent notion that early return to all activities is not harmful. Baker *et al*⁶¹ reiterated this in his 1994 paper suggesting that *"with regards to the duration of convalescence following an inguinal hernia repair, both surgeons and general practitioners are giving advice which is more in line with surgical thinking than it was the case a decade ago. This advice, however, is wrongly influenced by factors which have no effect on the subsequent success of the hernia repair"*. His group is quite blunt in stating *"most doctors are wrongly advising patients on when to return to work following an inguinal hernia repair."*

Another author, Rider *et al*⁶⁰, after undertaking a retrospective postal survey came to much the same conclusion and states in his 1993 work, *"in conclusion, this study indicates that the time off work following routine inguinal hernia repair is reducing and coming in to line with current surgical thinking. However, spurious factors such as the type of work continue to influence this time interval. Education of GP's and, before operation, of patients may be one method of successfully influencing this"*.

Another recent article from the U.K. looked at current principles and practices in how long patients convalesce after hernia repair. Robertson *et al*⁶³ felt that the responses to their survey showed that doctors continue to have 'definite' views on how long patients should remain off work. In particular they state, *"moreover, those GP's who advise relatively long periods of rest from sedentary work and also those that advise prolonged restraint from light or heavy work."* Thus, some practitioners appear generally conservative in their advice, while others tend to be more 'radical'. The authors further comment on the wide variation in practice and that *"previous studies suggest that an earlier return to work has no adverse consequences.... The degree of adherence to what has shown to be out dated dogma at first appears extraordinary..."*.

In 1994 Shulman⁸⁵ writes that post hernia repair *"... immediate return to full activity as soon as soreness permits has not increased recurrences. Several large studies in the United States, which have undertaken almost a quarter of a million operations, confirm this."*

He furthers this view and states: *“patient motivation is the driving factor in the decision to return-to-work and that depends on the confidence in their repair. This, in turn depends largely on what they have been told by the attending surgeon or physician. Repeated emphasis that what they do physically will not effect the strength of their repair reassures patients that early return to work is safe and justified... elimination of such iatrogenically induced anxiety can go far to reduce unnecessary time off work, thereby resulting in substantial economic savings.”*

In 1992, a former Professor and Chairman, Department of Surgery at the California College of Medicine, Bellis⁸³ writes about his experiences after undertaking 27,267 inguinal hernia repairs over his career. His article advocates a *“post operative regime of immediate post operative ambulation and unrestricted activity... return-to-work requiring heavy lifting the same day reduces tension on the mesh, increases the strength of the incision, prevents complications and minimizes pain.”*

A recent paper out of Denmark⁸⁴ undertook a prospective, descriptive, consecutive questionnaire case series on 100 patients who were treated for inguinal hernia. The main outcome measure in this 1999 study was ‘duration of absence from work or main recreational activity’. Prior to surgery the patients were advised to resume all normal duties the day after operation but to postpone heavy physical work (i.e.: furniture movers) or energetic sporting activities for three weeks. Their survey results suggested 64 patients did not follow their recommendation because of pain and/or advice from the general practitioner. The overall median number of days absent from work was six. This study once again brings to light the importance of setting expectations based on evidence already within the literature. It also suggests again that education of health professionals as well as patients is necessary. This is in line with the thinking of Ross¹¹⁴ as well as that of Semmence and Kynch¹¹³.

There are innumerable papers on the subject of what constitutes ‘appropriate’ post operative convalescence. A few of those papers have been described above to give the reader a sense of what much of the literature is saying or has said on this subject. Much of it seems to be of the ‘opinion’ variety, which (as any textbook or article on evidence based medicine will tell the reader) is the lowest quality of evidence. Such ‘evidence’ should encourage decision makers to search for higher quality information prior to making any significant decisions. In keeping with this theme, section 6.2 follows and outlines some of the issues at hand.

6.2 Post Operative Convalescence – Data from the Literature

It is evident in the medical and surgical literature that what is documented and studied in those journals does not always translate quickly or easily in to the ‘real’ world. This holds true for many aspects of medicine in general. However, this portion of the paper will attempt to answer the question, *“What does the literature say about post hernia repair convalescence?”*. i.e.: What advice should practitioners be giving patients about their post op recovery, including return to full activities and work?

To this end, an extensive review of 140 articles relating to hernia and its post operative natural history were analyzed with a view to establishing a database of postoperative time courses. All articles were manually searched for data on this subject. All articles were cross-referenced and other articles presented in Appendix B, where appropriate, were obtained. All days quoted refer to days to return-to-work (RTW) or, if noted, return to activities of daily living (RADL). Where stated in the article, it was noted if the days were mean, median or ranges. Similar data was then extracted (i.e. means or medians) in conjunction with the number of patients in the study and are seen in Appendix C (tabular) and Appendices D-G (graphical).

It is also evident that most of the research on surgical repair of hernia contrasts various parameters of open (O) repair and laparoscopic (L) hernia repairs. These are separately noted in Appendices C-H.

A recent 'Cochrane Collaboration' review¹⁴⁸ (Appendix I) on hernia repairs will be discussed separately in section 7.0. Because of its international reputation as, perhaps THE authoritative source of evidence based reviews, the Evidence-based group feels this paper (recently updated, November 2001) warrants special attention.

Appendix C is a compilation / collation of all papers retrieved that describe studies looking at time to return-to-work (RTW) or time to return to activities of daily living (RADL) after 'open or 'laparoscopic' hernia repair. The accompanying table and graph outline the numbers of patients involved in each trial, their 'mean' or median RTW or RADL time (in days, where stated) and a running total of the aggregate numbers of patients.

The final 'figures' invite further comment. As one can see, both open and laparoscopic groups suggest post operative return to work (RTW) or return to activities of daily living (RADL) takes place in the majority of patients in, approximately, under 30 days. We feel this is a conservative estimate of what the literature reflects.

Further, (and we feel this is quite important to note since it is to be expected that increasing numbers of hernia repairs are undertaken via the laparoscopic route in B.C.) it is evident that the minimally invasive or laparoscopic route of hernia repair allows most patients to RTW / RADL in under or about 14 days. Combining both groups of data from each arm of data, open and laparoscopic, retrieved (Appendix C) suggests a mean, combined RTW /RADL of approximately 19 days (Table 6.2.1) and a median RTW/RADL time of approximately 14 days (Table 6.2.2).

Table 6.2.1			
<u>Mean Data (days)</u>			
<u>Laparoscopy</u>	<u>#Patients</u>	<u>Open</u>	<u>#Patients</u>
<u>Group</u>		<u>Group</u>	
11.7 days	3965	27.2 days	3643
<u>Mean (average) RTW or RADL for all groups combined = 19.2 days (7734 patients)</u>			

Table 6.2.2			
<u>Median Data (days)</u>			
<u>Laparoscopy</u>	<u>#Patients</u>	<u>Open</u>	<u>#Patients</u>
<u>Group</u>		<u>Group</u>	
14.0 days	7482	8.0 days	4885
<u>Median RTW / RADL for all groups combined = 14 days (12367 patients)</u>			

While the specifics of the above data calculations may be open to academic debate, it appears clear that the WCB's present policy of allowing close to 42 days for post operative convalescence is not supported by the above data.

The reader is encouraged to review Section 7.0 on the Cochrane Collaboration review (2001) that has published data on this subject as well, which should be viewed as an authoritative and independent review of this same issue.

6.3 Early Return to Work and the Risk of Recurrent Hernia

The rate of recurrence after primary hernia surgery varies from 0% to 30%¹⁸⁸⁻²⁰⁰. In a tissue-based tension repair, 50% of recurrences do not appear until more than 5 years post-operative. In contrast, in a prosthetic-based hernia repair (either open or laparoscopically done), the majority of the recurrences usually occur within the first 3 years¹⁹⁰.

Various factors have been identified as associated with hernia recurrence. These factors include:

- the type of operation (open or laparoscopic; prosthetic or tissue based),
- duration of follow-up of the study,
- surgeon's expertise (surgical error),
- large primary hernia size (≥ 5 cm),
- having chronic obstructive pulmonary disease,
- post-operative complications such as inguinal haematoma,
- age (older patient is more likely to relapse),
- smoker,
- history of previous abdominal surgery and
- alcohol consumption²⁰¹⁻²¹².

Searches on published literature via PubMed failed to identify any study looking specifically into the association between early return to work and the risk of hernia relapse. One study showed a negative relationship between physical activity and hernia relapse²¹². There were twice as many patients who did not relapse and did physical activities compared to those who relapse and did physical activities during 34 months follow-up. Based on this study alone, the association between physical activities and hernia recurrence is still inconclusive since this study was a retrospective, observational in nature and failed to take into account other factors that may affect hernia relapse. Another and methodologically better study²⁰⁶ showed that the employment status of the patients did not affect hernia recurrence.

6.4 Time Frame of Recurrent Hernia

RS & CM Policy item # 15.51 on hernia reopenings and recurrences provides 18 months as the cut off point for automatic re-opening of previously accepted hernia claims.

Beside the expert statement above¹⁹⁰, anecdotal evidence shows that about 64% of hernia recurrences occurred in the 1st year after hernia repair and about 90% occurred in 2 year after hernia repair^{188, 205}.

On the issue of recurrent hernia, Saskatchewan²¹⁸ and Alberta²¹⁹ Worker's Compensation Boards provide 1 year as the cut off point for automatic re-opening of previously accepted hernia claims. Thus, presently there is no evidence in the literature to dispute RS & CM Policy item #15.51 regarding 18 months as the cut off point to automatically re-open previously accepted hernia claims in the event of recurrent hernia.

7.0 COCHRANE LIBRARY DOCUMENT

Appendix I gives an in depth background of the United Kingdom based group called the Cochrane Collaboration. This group, now an international effort (15 countries, including Canada) has, as part of its mandate, a system to undertake “*systematic reviews of health care intervention*”. These reviews are undertaken using only strict, evidence based, scientifically sound principles.

To this end, a November 2001 update in the Cochrane Library, “Laparoscopic techniques versus open techniques for inguinal hernia repair” (Webb *et al*¹⁴⁸) was felt to be a necessary part of this document, requiring special mention.

This Cochrane review, whose objectives were stated as “... *to compare minimal access laparoscopic mesh techniques with open techniques for the repair of inguinal hernia*” undertook a world wide, systematic literature review on this topic. While their purpose was not entirely consistent with our Evidence-based group’s questions on the same topic, the Cochrane review did collect a significant amount of data. Of significance to WCB is the data the Cochrane group collected on return to work / return to normal activities / time off work. They, like our group, extracted this data, in days, from the various scientific papers. The spreadsheet outlining this data is attached in Appendix H. The results, for our purposes, are summarized below in Table 7.1.1 and Table 7.1.2.

Table 7.1.1			
<u>Post operative convalescence time in days</u>			
- <u>Mean</u> data from Cochrane study			
<u>Laparoscopy</u>		<u>Open</u>	
<u>Group</u>	<u>#Patients</u>	<u>Group</u>	<u>#Patients</u>
13.5 days	620	20.4 days	900
<u>Mean (average) RTW or RADL for all groups combined</u> = 17.6 days (1520 patients)			

Table 7.1.2			
<u>Post operative convalescence time in days</u>			
- <u>Median</u> data from Cochrane study			
<u>Laparoscopy</u>		<u>Open</u>	
<u>Group</u>	<u>#Patients</u>	<u>Group</u>	<u>#Patients</u>
14.0 days	1106	21.0 days	1123
<u>Median RTW or RADL for all groups combined</u> = 15.0 days (2229 patients)			

You will note in Appendix H that other RTW / RADL values were collected (e.g. range). However, because the majority of these were classified as 'unclear', our Evidence-based group has opted not to include these figures in a separate table, but will leave the figures available to the reader for their own interpretation.

8.0 DISCUSSION / CONCLUSION

8.1 Etiology – policy consideration

The literature review on the etiology of abdominal wall hernia does not give a clear cut answer to the issue of whether physical stresses or events(s) can be said to be causative of these types of hernia. From an academic standpoint, Hill (1978¹⁸⁶) had set out 9 criteria (Table 8.1.1) for examining a causal relationship. However, it is evident that few of these criteria are met and or even addressed by the literature reviewed.

Table 8.1.1

Criteria For Examining A Causal Relationship (Hill, 1978¹⁸⁶)

Causative Criteria

- strength of association
- consistency of the observed evidence
- specificity of the relationship
- temporality of the relationship
- biological gradient of the dose – response
- biological plausibility
- coherence of the evidence
- experimental confirmation
- reasoning by analogy

With this in mind, the Evidence-based Practice Group feels that an overall ‘judgement’ needs to be made in this regard. The Evidence-based group feels that the evidence suggests that physical effort can be a significant factor in the ultimate appearance and symptomatic development of an abdominal wall hernia. It is also evident that physical effort is, not in itself, enough to ‘cause’ a hernia. All hernia require multiple factors to come into play – the literature suggests that heredity (genetic pre-disposition), co-morbid factors (diabetes, poor nutritional status, intra-abdominal pathology causing chronic raised intra-abdominal pressure, prior abdominal wall incisions and other factors), or what smoking and a myriad of other, perhaps less important factors, are necessary for hernia to develop.

Certainly, putting such ‘judgement’ into practice within a compensation setting, is difficult. In any one particular case many risk factors may be present. It is of interest to note that a number of United Kingdom studies and reviews comment on this particular aspect of hernia development. It appears that many of these authors have similar thoughts in judging how these herniae may or may not be related to employment.

G.D. Smith⁴⁹ suggests the following criteria be addressed in deciding on the 'compensability' of a claim:

- there must be evidence of a reported 'incident' i.e.: physical effort
- groin pain at the time of the reported physical effort / incident
- diagnosis of an inguinal hernia by an M.D., preferably within 3 days of the 'incident' and certainly within 30 days.
- no history of prior inguinal hernia

One notes that at present, Section 15.50 of the Rehabilitation Services and Claims Manual already contains these essential elements within it. Hence, the Evidence Based Group concludes that the present wording around the entitlement or initial adjudication of abdominal wall hernia is consistent with the current surgical and epidemiological literature on groin hernia.

It is of interest to note that this whole subject of hernia and disability and its compensability is not a new subject. Even back in 1948, Watson¹¹⁰ noted in the chapter on 'Industrial hernia' that

"Instead of being based on anatomical facts, the status of the hernia patient has been the subject of much social legislation. The problem and its solution represents a compromise between medical facts and public policy."

8.2 Post Operative Time Off Work – policy consideration.

The data, as collected by both the Evidence-based group and the Cochrane study appears clear in one regard. The WCB's present 42 day 'limit' in policy 15.50 is not in keeping with the current medical / surgical literature. The WCB should consider changing that policy to reflect the world literature.

Options include making no mention of an exact number of post operative days' wage loss that the WCB would pay for or alternately, choosing a number from the above data that reflects both the surgical literature and the present social policies. If a specific 'number' of days is to be included in any policy change the WCB needs to decide whether this should be an average (mean), median or another statistical entity consistent with the data.

8.3 Other Policy Considerations

For the reasons described in section 5.3, it is felt that the existing WCB policy on herniae should be modified and expanded such that;

- i) Non-inguinal herniae may be acceptable as 'compensable' based on criteria similar to that of inguinal herniae.
- ii) All 'acceptable' herniae should be accepted by the WCB on the basis of an 'aggravation' of a pre-existing condition.

8.4 Recurrent Herniae

The review did not provide any evidence to change the current RS & CM policy item # 15.51 on automatic re-opening of previously accepted hernia claims in the event of hernia recurrence within 18 months of initial hernia repair.

All other medical aspects of 15.51 are, in the opinion of the Evidence-based group, reasonable and are not contradicted by the current surgical literature.

9.0 FINANCIAL IMPLICATIONS OF PROPOSED CHANGES TO POLICY 15.50

Data noted below was downloaded from WCB Enterprise Datawarehouse on August 28, 2002, WCB DB2 Mainframe database (MPDET and MDINV tables; online and MSP billings) on September 25, 2002 and some were provided by K. Mason and P. Sohi.

The average number of days wage loss paid on each of the 379 annually accepted hernia claims is 43. At present, the data does not allow us to say what percentage of these days wage loss were pre or postoperative. However, from a medical standpoint, one can assume that the vast majority ($\pm 90\%$) of all time loss would be postoperative.

Both online and MSP billings suggests 255 hernia repairs are undertaken each year. As noted earlier in section 7.0, this 'low' surgical rate begs the question as to how 'valid' the data really is. From a medical/surgical standpoint it would be expected that the vast majority of patients diagnosed with a hernia would ultimately come to have a surgical repair undertaken. WCB's statistics suggest only a 68% surgical rate. Despite these concerns with the data, the financial analysis outlined below will use this data, hence all estimates should be considered to be very conservative.

If there are 255 surgeries per year and 90% of all the time loss is postoperative;

255 surgeries x 43 days total time loss x 90% postoperative time loss portion
= 9869 postoperative time loss days in total per year (this equals 38.7 calendar days per claim)

If one then suggests (as the literature does) that a postoperative recovery (return to work/return to normal activities) of, say, 15 days is more appropriate, then there would be a significant financial savings of:

255 surgeries per year x 15 days postoperative time loss
= 3825 post operative days time loss

\therefore 9869 days - 3825 days = 6044 days time loss savings per year

\therefore 6044 days time loss x \$100 wage loss per day on average = \$604,400 per year savings

Obviously the above does not take into account the 'human' costs savings i.e.: injured workers can safely return to their normal activities 23.7 days (38.7-15 days) earlier than past experience and practice has dictated.

Also of note is the fact that from 1987-2001 20 claims received a pension and the average LTD award / reserve was \$154,000. It is reasonable to conclude that an earlier

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return to normal activities may well decrease long-term postoperative problems which the occasional worker experiences. As a consequence, one could anticipate a decrease in LTD costs for such hernia claims.

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APPENDIX A

ETIOLOGY / PATHOPHYSIOLOGY / EPIDEMIOLOGY OF HERNIA

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APPENDIX B

RETURN TO ACTIVITY / POST OPERATIVE CONVALESCENCE

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APPENDIX C

WCB OF BC EVIDENCE-BASED GROUP HERNIA STUDY RESULTS IN TABULAR FORM

Mean Data					Median Data					Other Data						
Study (Ref #)	Laparoscopy (L)		Open (O)		Study (Ref #)	Laparoscopy (L)		Open (O)		Study (Ref #)	Laparoscopy (L)			Open (O)		
	Mean	(N) # of patients	Mean	(N) # of patients		Median	(N) # of patients	Median	(N) # of patient		Mean/Median	Range	(N) # of patients	Mean/Median	Range	(N) # of patients
Payne et al (115)	9.0	48.0	17.0	52.0	Stoker (1)	14.0	40.0	28.0	39.0	Hawasli et al (125)		7.0-14.0	77.0			
Champault et al (120)	12.5	92.0	24.3	89.0	Lawrence et al (91)	22.0	58.0	28.0	66.0	Geis et al (142)		3.0-10.0	364.0			
Barkun et al (116)	9.6	43.0	10.9	49.0	Dirksen et al (22)	14.0	88.0	22.0	87.0	Rubio et al (137)		3.0-8.0	97.0			
Kald et al (39)	10.0	74.0	23.0	60.0	Juul et al (12)	13.0	138.0	18.0	130.0	Himpens (124)	7.0		25.0			
Liem et al (41)	14.0	487.0	21.0	507.0	Heikkinen et al (17)	12.0	22.0	17.0	23.0	Felix P et al (28)	7.0		100.0			
Beets et al (14)	13.0	42.0	23.0	37.0	Heikkinen et al (20)	14.0	18.0	21.0	20.0	Metzger J et al (175)		17.5-28	247.0			
Ferzli et al (11)	4.0	100.0			Wellwood et al (25)	21.0	200.0	26.0	200.0	Kiruparan P et al (173)		7.0-14.0	200.0			
Kingsley et al (15)	7.5	30.0	18.5	31.0	Paganini et al (27)	15.0	52.0	14.0	56.0							
Zieran et al (32)	16.0	80.0	22.0	160.0	Tanphiphat et al (29)	14.0	60.0	15.0	60.0							
Tschudi et al (167)	25.0	44.0	48.0	43.0	Aitola et al (30)	7.0	24.0	5.0	25.0							
Schrenk et al (138)	34.0	28.0	35.0	34.0	Barth et al (33)			9.0	105.0							
Schultz et al (146)	3.3	20.0			Heikinen et al (43)	14.0	20.0	19.0	18.0							
Felix EL et al (98)	7.0	866.0			Maddern et al (126)	17.5	42.0	30.0	44.0							
Newman et al (160)	9.7	88.0			Leibl et al (144)	21.0	54.0	38.0	48.0							
Paget et al (139)	13.4	207.0			Kald et al (117)	21.0	294.0									
Toy and Smoot (128)	3.0	75.0			Salcedo-Wasicek et al (64)			22.5	44.0							
Chan et al (130)	7.0	39.0			Friis et al (131)			21.5	137.0							
Cornell Kerlakian (134)	16.0	48.0	36.0	21.0	Wilson et al (147)	10.0	121.0	21.0	121.0							
Danielsson et al (141)			21.0	72.0	Thorup et al (82)			21.0	105.0							
Prior et al (133)			23.6	80.0	Callesen et al (84)			6.0	55.0							
Pirski et al (145)			17.5	100.0	Bourke et al (89)			48.0	369.0							
Johansson et al (132)	18.4	204.0	25.3	409.0	O'Riordain et al (18)	2.5	56.0									
Wheeler et al (129)	6.2	135.0			Mills IW et al (24)			40.5	50.0							
Voeller et al (123)	2.0	47.0			O'Riordain et al (102)	6.0	87.0									
Champault et al (36)	17.0	21.0	35.0	19.0	Heikkinen et al (87)	14.0	20.0	19.0	18.0							
Seid et al (121)	5.0	25.0			Jones KR et al (177)			7.0	93.0							
Millikan (122)	9.0	75.0	48.0	51.0	Fleming et al (179)	14.0	116.0	30.0	115.0							
Felix EL et al (106)	7.0	183.0			Papachristou EA et al (184)	6.0	234.0	12.0	86.0							
Merello (143)	11.0	60.0	26.0	60.0	Schmedt CG et al (9)	14.0	5524.0									
Toy FK et al (109)	15.0	135.0			MRC Hernia trial group (136)	28.0	162.0	42.0	153.0							
Marre P et al (181)			15.4	435.0	Kark A et al (176)			8.0	2523.0							
Lafferty et al (178)			8.0	100.0	Bessell JR et al (214)	30.5	32.0	32.0	72.0							
Thapar V et al (182)			8.0	34.0	Sarli L et al (213)	16.0	20.0	30.0	23.0							

Appendix C – WCB Of BC Evidence-Based Group Hernia Study Results In Tabular Form (Cont'd)

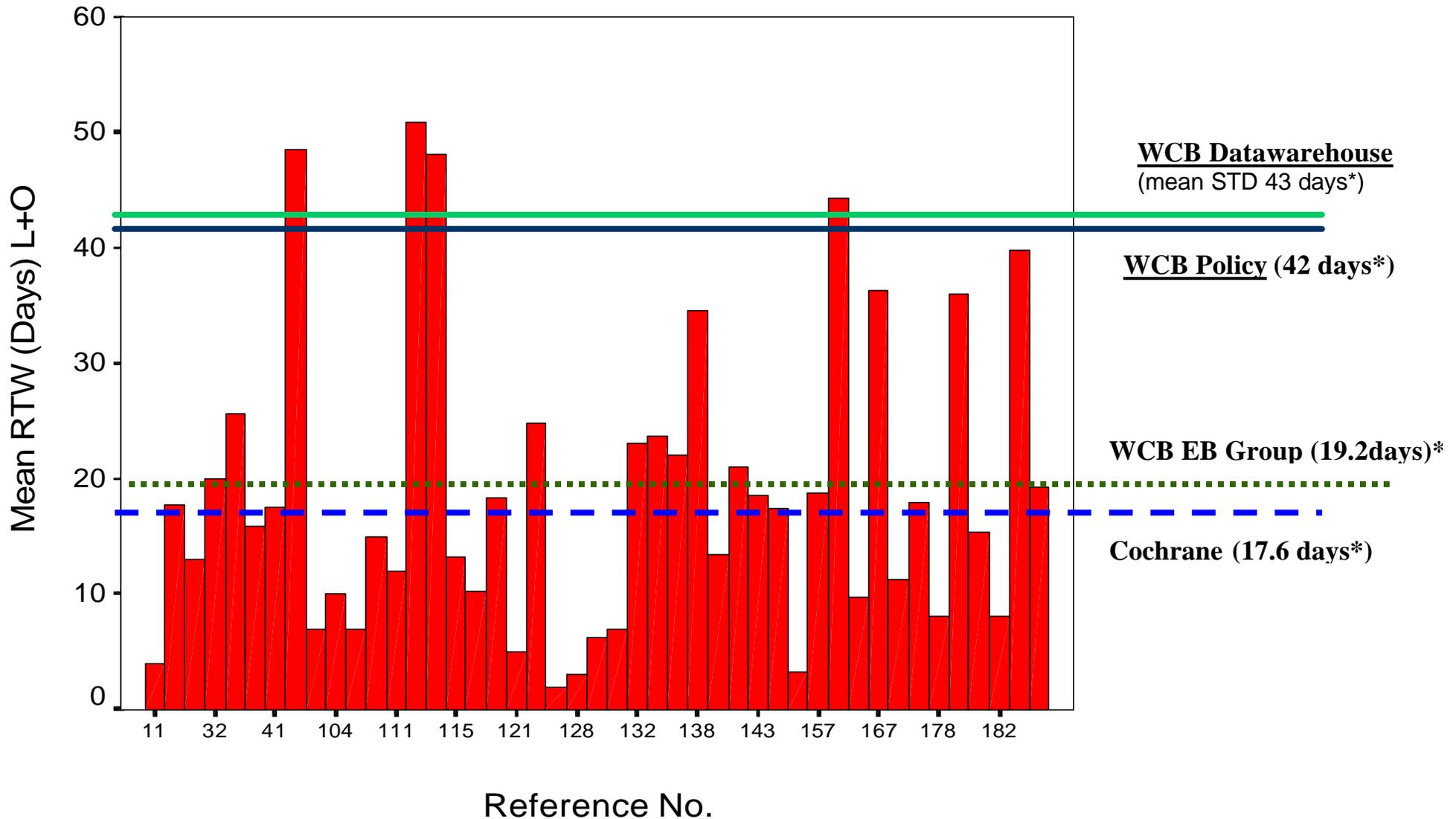
Mean Data					Median Data				Other Data							
Study (Ref #)	Laparoscopy (L)		Open (O)		Study (Ref #)	Laparoscopy (L)		Open (O)		Study (Ref #)	Laparoscopy (L)			Open (O)		
	Mean	(N) # of patients	Mean	(N) # of patients		Median	(N) # of patients	Median	(N) # of patient		Mean/Median	Range	(N) # of patients	Mean/Median	Range	(N) # of patients
Picchio M et al (159)	45.5	53.0	43.0	52.0												
Lawrence K et al (171)	25.0	L+O = 126.0														
Robertson GSM et al (63)			48.5	107.0												
Ambach R et al (174)			17.9	73.0												
Brooks DC (104)	7.5	43.0	11.8	57.0												
Ross APJ (114)			48.0	260.0												
Ferzli et al (111)	3.9	25.0	20.1	25.0												
Kald et al (172)	11.2	426.0														
Lau H et al (185)			19.3	121.0												
Semmence A et al (113)			50.8	261.0												
Lukaszczyk JJ et al (157)	15.1	36.0	21.2	54.0												
Overall Mean/Median/Range:	11.7	3965.0	27.2	3643.0		14.0	7482.0	8.0	4885.0		7.0	3.0-28.0	1110.0			
L+O Mean/Median/Range:	Mean:	19.2	N:	7734.0		Median: 14.0	N: 12367									

Calculations for Mean Data	
Calculations of L or O Overall Mean:(weighted mean)	1) Multiply the number of patients and mean of each study separately and sum these products for Laparoscopic and Open procedures separately. Sum the number of patients in each procedure. 2) Divide the sum of the products by the sum of number of patients. Ref#171 was not included.
Calculation of L+O Mean: (weighted mean)	1) Multiply the number of patients and mean of each study separately and sum these products for Laparoscopic and Open procedures separately. Sum the number of patients in each procedure. 2) Divide the sum of the products by the sum of number of patients. Ref#171 was only included in the calculation of L+O.
Calculations for Median Data	
Calculations for Overall Median: (weighted median)	1) The number of Median value of each study was generated according to their respective sample size. Laparoscopic and Open procedure was generated and then combined separately. 2) The combined median value of each procedure was done computed.
Calculation of L+O Median: (weighted median)	1) The number of Median value of each study was generated according to their respective sample size. Laparoscopic and Open procedure was generated and then combined together. 2) The combined median value was done computed.
Calculations for Other Data:	
Calculations for Overall Mean/Median:	Show the range of the lowest and the highest mean/median value found in the studies listed under this category.
Calculations for L+O Mean/Median:	Show the range of the lowest and the highest mean/median value found in the studies listed under this category.
Calculations for Range:	Show the range of the lowest and the highest mean/median value found in the studies listed under this category.

* Ref. # 9 and # 176 are not included in these calculation.

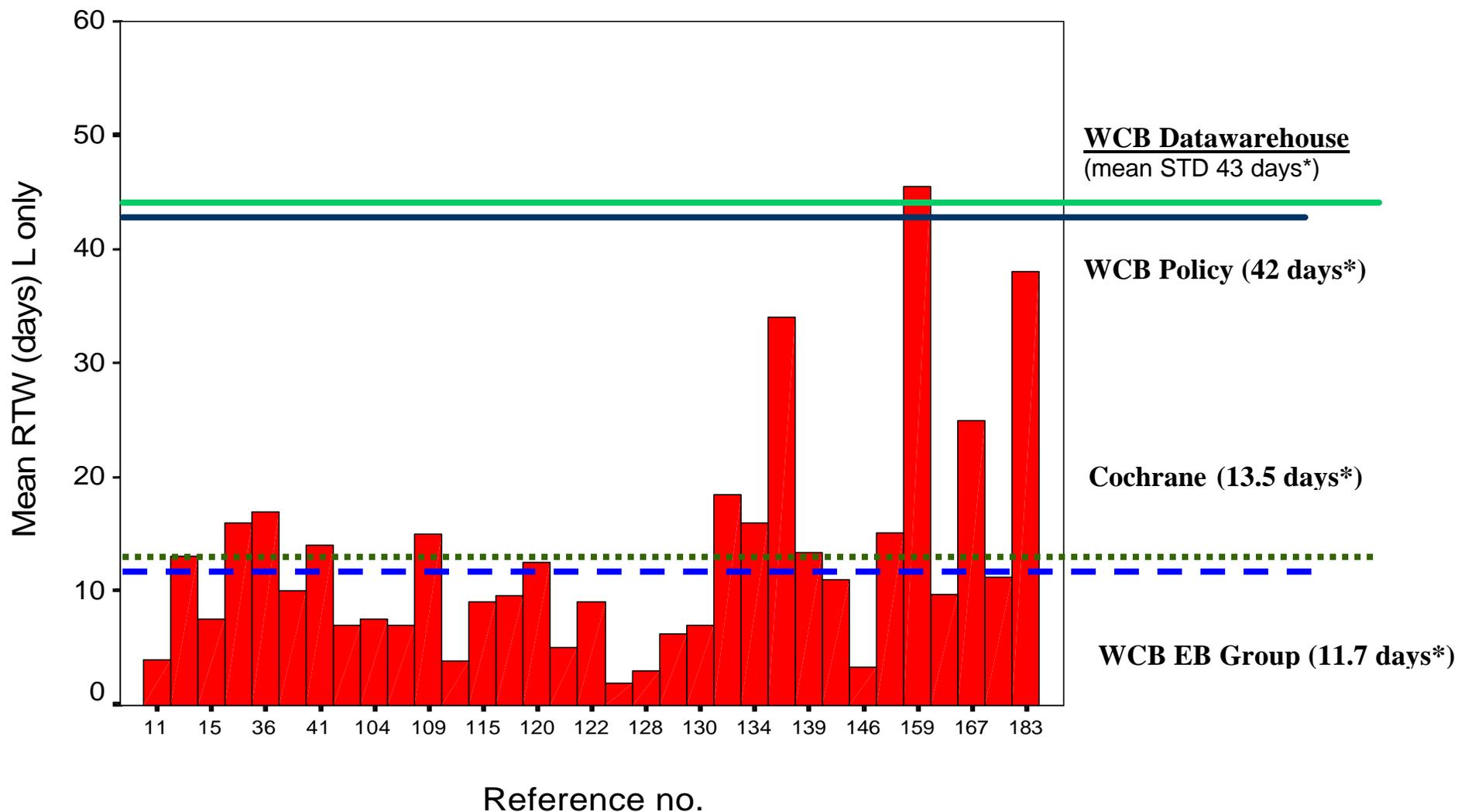
APPENDIX D

MEAN RETURN TO WORK OR DAILY ACTIVITIES (* CALENDAR DAYS). LAPAROSCOPIC AND OPEN HERNIORRHAPHY PROCEDURES COMBINED.



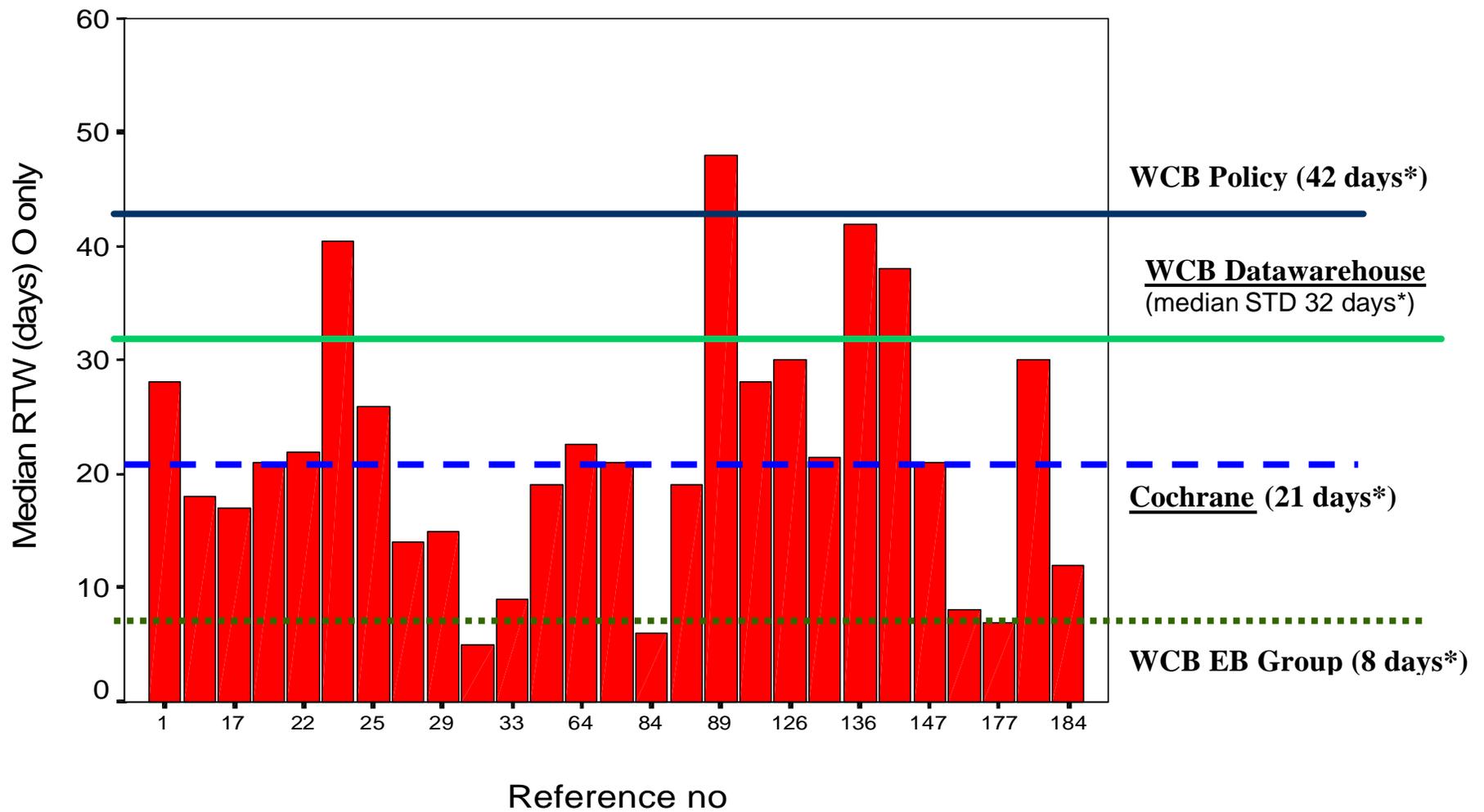
APPENDIX E

Mean return to work or daily activities (* calendar days). Laparoscopic herniorrhaphy procedure only.



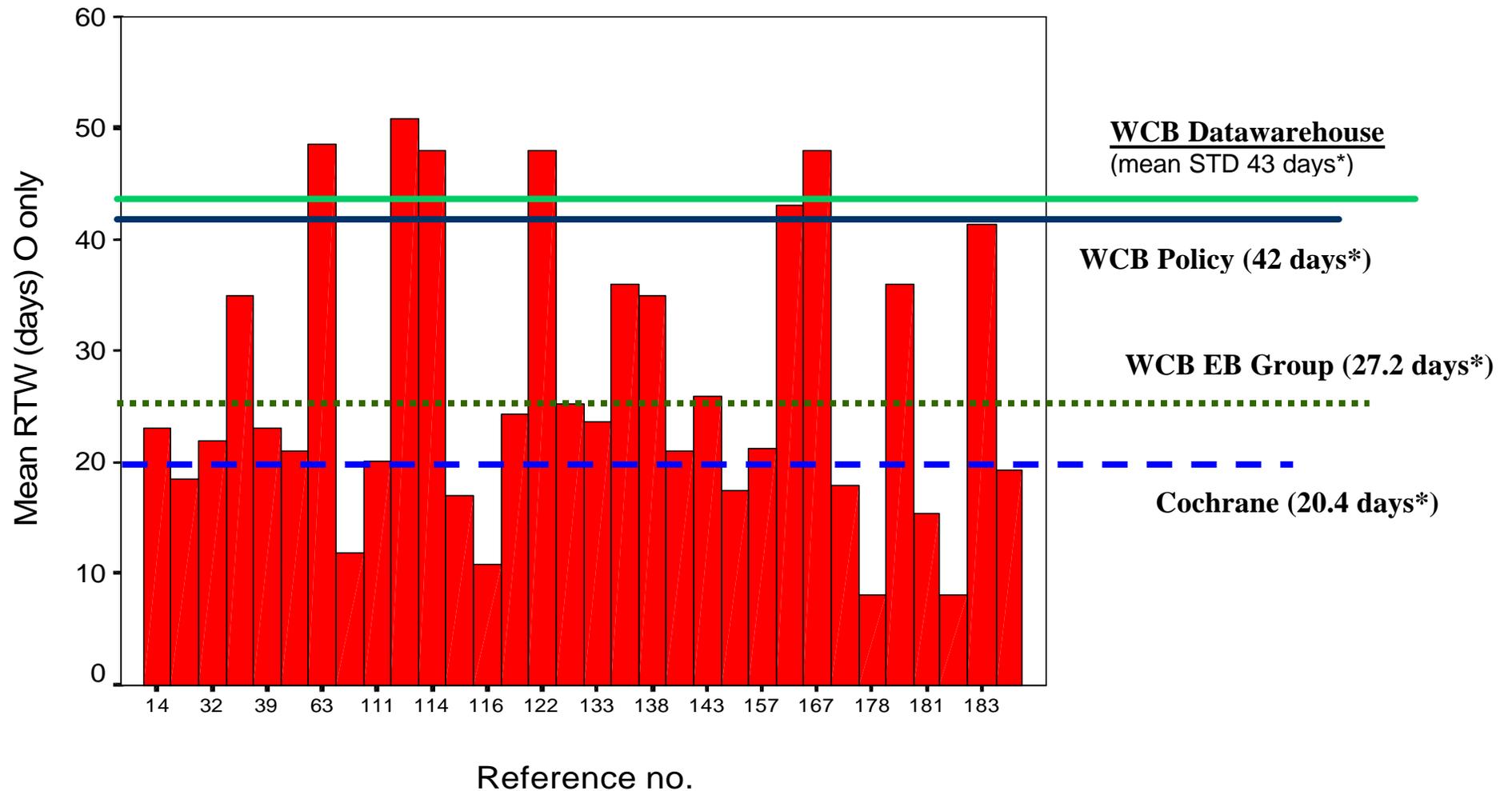
APPENDIX F

MEDIAN RETURN TO WORK OR DAILY ACTIVITIES (* CALENDAR DAYS). OPEN HERNIORRHAPHY PROCEDURE ONLY.



APPENDIX G

MEAN RETURN TO WORK OR DAILY ACTIVITIES (* CALENDAR DAYS). OPEN HERNIORRHAPHY PROCEDURE ONLY.



APPENDIX H

COCHRANE COLLABORATION STUDY

Laparoscopic techniques versus open techniques for inguinal hernia repair: Webb K, Scott NW, Go PMNYH, Ross S, Grant AM on behalf of the EU Hernia Trialist Collaboration

Mean Data					Median Data					Other Data						
Laparoscopy (L)		Open (O)			Laparoscopy (L)		Open (O)			Laparoscopy (L)		Open (O)				
Study (Ref #)	Mean (days)	(N) # of patients	Mean (days)	(N) # of Patients	Study (Ref #)	Median (days)	(N) # of patients	Median (days)	(N) # of patients	Study (Ref #)	Mean/Median	Range	(N) # of patients	Mean/Median	Range	(N) # of patients
Berlin 1996	3.0	80.0	7.5	160	Adelaide 1994	17.5	42.0	30.0	44.0	Bietigheim 1998	25.0		93.0	36.0		93.0
Caen 1998	28.6	32.0	35.5	32.0	Acona 1998	15.0	52.0	14.0	56.0	(unclear values)				44.0		94.0
Linz 1996	4.9	28.0	4.8	24.0	Bangkok 1998	14.0	60.0	15.0	60.0	Stuttgart 1995 (unclear values)	21.0		54.0	38.0		48.0
Maastricht 1999	13.0	42.0	23.0	37.0	Kokkola 1997	14.0	20.0	19.0	18.0	Tournai 1996 (unclear values)	29.0		35.0	30.0		35.0
Parma 1997	14.0	52.0	14.0	56.0	Nyborg 1999	13.0	138.0	18.0	130.0	Brisbane 1996	10.0		L+O 184	21.0		L+O 184
SCUR 1999	18.4	204	25.3	409	Oxford 1995	22.0	58.0	28.0	66.0							
Linz 1996	4.6	28.0	4.8	24.0	Tampere 1998	7.0	24.0	5.0	25.0							
Madrid 1997	11.0	60.0	26.0	60.0	Whipps Cross '94	14.0	75.0	28.0	75.0							
Paris 1997	17.0	51.0	35.0	49.0	Coala Trial Gp '97	14.0	487.0	21.0	507.0							
Montreal '95	9.6	43.0	10.9	49.0	Quebec 1998	8.0	150.0	15.0	142.0							
Overall Mean:	13.5	620	20.4	900	Overall Median:	14.0	1106	21.0	1123	Range of the Mean/Median:	21.0–29.0	182	30.0 – 44.0	270		
L+O Mean:	Mean: 17.6	N = 1520			L + O Median:	Median: 15.0	N = 2229			L+O range of Mean/Median:	10.0 – 44.0	N = 636				

Calculations for Mean Data

- Calculations of L or O Overall Mean:(weighted mean)
- 1) Multiply the number of patients and mean of each study separately and sum these products for Laparoscopic and Open procedures separately. Sum the number of patients in each procedure.
 - 2) Divide the sum of the products by the sum of number of patients. Ref#171 was not included.
- Calculation of L+O Mean: (weighted mean)
- 1) Multiply the number of patients and mean of each study separately and sum these products for Laparoscopic and Open procedures separately. Sum the number of patients in each procedure.
 - 2) Divide the sum of the products by the sum of number of patients. Ref#171 was only included in the calculation of L+O.

Appendix H - Cochrane Collaboration Study (cont'd)

Calculations for Median Data	
Calculations for Overall Median: (weighted median)	1) The number of Median value of each study was generated according to their respective sample size. Laparoscopic and Open procedure was generated and then combined separately. 2) The combined median value of each procedure was done computed.
Calculation of L+O Median: (weighted median)	1) The number of Median value of each study was generated according to their respective sample size. Laparoscopic and Open procedure was generated and then combined together. 2) The combined median value was done computed.
Calculations for Other Data:	
Calculations for Overall Mean/Median:	Show the range of the lowest and the highest mean/median value found in the studies listed under this category.
Calculations for L+O Mean/Median:	Show the range of the lowest and the highest mean/median value found in the studies listed under this category.
Calculations for Range:	Show the range of the lowest and the highest mean/median value found in the studies listed under this category.

APPENDIX I

COCHRANE COLLABORATION REVIEW

No one can keep up to date with the relevant evidence in one's field of interest. The major bibliographic databases cover less than half the world's literature and are biased towards English language publications. Of the evidence available in the major databases, only a fraction can be found by the average searcher. Textbooks, editorials and reviews which have not been prepared systematically may be unreliable. Much evidence is unpublished, but unpublished evidence may be important. More easily accessible research reports tend to exaggerate the benefits of interventions.

The Cochrane Library solves many of these problems. Published on a quarterly basis and made available both on CD-ROM and the Internet ([see 'How to get access'](#)), it is the best single source of reliable evidence about the effects of health care.

The Cochrane Library consists of a regularly updated collection of evidence-based medicine databases, including The Cochrane Database of Systematic Reviews - evidence based systematic reviews prepared by the [Cochrane Collaboration](#) which provide high quality information to people providing and receiving care and those responsible for research, teaching, funding and administration at all levels. See [The Introduction to Cochrane Library web page](#) for more information about the contents of The Cochrane Library.

The Databases

The Cochrane Database of Systematic Reviews

Cochrane Reviews are full text articles reviewing the effects of healthcare. The reviews are highly structured and systematic, with evidence included or excluded on the basis of explicit quality criteria, to minimise bias.

Data are often combined statistically (with meta-analysis) to increase the power of the findings of numerous studies, each too small to produce reliable results individually.

The Database of Abstracts of Reviews of Effectiveness DARE includes structured abstracts of systematic reviews from around the world, which have been critically appraised by reviewers at the NHS Centre for Reviews and Dissemination at the University of York, England.

DARE also contains references to other reviews which may be useful for background information.

The Cochrane Controlled Trials Register

CCTR is a bibliography of controlled trials identified by contributors to the Cochrane Collaboration and others, as part of an international effort to hand search the world's journals and create an unbiased source of data for systematic reviews.

CCTR includes reports published in conference proceedings and in many other sources not currently listed in MEDLINE or other bibliographic databases.

The Cochrane Methodology Register

A bibliography of articles and books on the science of research synthesis.

Appendix I - Cochrane Collaboration Review (Cont'd)

The NHS Economic Evaluation Database

A register of published economic evaluations of health care interventions. Economic evaluation records include a structured summary and a qualitative assessment together with details of any practical implications for the NHS.

Health Technology Assessment Database

Contains information on healthcare technology assessments.

Cochrane Database of Methodology Reviews (CDMR)

Includes the full text of systematic reviews of empirical methodological studies prepared by The Cochrane Empirical Methodological Studies Methods Group.

Also Includes

A handbook on critical appraisal and the science of reviewing research.

A glossary of methodological terms.

Contact details for Collaborative Review Groups and other entities in the Cochrane Collaboration.

Technical Description

CD-ROM version for Microsoft Windows

The CD-ROM version of The Cochrane Library is intended for installation on stand-alone machines and on small to medium sized local-area networks. The program is 'read-only' for the most part and may be run directly from the CD-ROM. However to view all the data you will need to have about 250MB available on the computers hard disk.

Alternatively, all program and data files may be installed on the computer's hard disk. Together the program and data files occupy about 800MB. The CD-ROM version requires a PC with 486SX processor or higher, with minimum 8MB RAM. The Cochrane Library CD-ROM is produced only as a Microsoft Windows program.

Internet Access

The Cochrane Library Online is an installation of the complete Cochrane Library that may be accessed using a standard Internet browser, such as Mosaic, Internet Explorer, or Netscape. The Cochrane Library Online has all of the data and most of the functionality of the popular CD-ROM version, but is not limited to computers running Microsoft Windows. The Cochrane Library Online is available directly from Update Software, with servers in Oxford (England), Freiburg (Germany) and San Diego (USA). It is also available through our distribution partners. Cochrane Collaboration Review found at: [http:// www.update-software.com/cochrane/](http://www.update-software.com/cochrane/)

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